PLANTERS' BULLETIN

OF THE RUBBER RESEARCH INSTITUTE OF MALAYA

PLANTERS' BULLETIN THIRTYONE

CONTENTS

	Page
Editorial: Nutritional Needs of Hevea	63
Effect of Manuring on Growth and Yield	64
Magnesium Deficiency	66
Sheeting Batteries and the Law	69
Trial of the Holt Weed Breaker	74
Despatch of Pathological Specimens	77
R.R.I. News, Notes, Correspondence	78, 79, 80

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R R I

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EXPERIMENT STATION AND FACTORY. This station of the R R I is situated 16 miles from Kuala Lumpur, at Sungei Buloh on the Kuala Lumpur — Kepong — Kuala Selangor road. Visits may be made on Mondays or Wednesdays by arrangement. There is a guest house.

CORRESPONDENCE. All LETTERS must be addressed to the Director, Rubber Research Institute of Malaya, Post Office Box 150, Kuala Lumpur. Special inquiries may be marked for the attention of particular officers. The address for TELEGRAMS is Searching, Kuala Lumpur. TELEPHONE: Kuala Lumpur 3351. PARCELS occasionally arrive without any indication of their origin. Senders' names and addresses should be written clearly on the outside of all packages, and advice of despatch should be given by letter or telegram.

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ADVICE. Inquiries are invited from rubber producers in the Federation of Malaya, the Colonies of Singapore and North Borneo, and the territories of Sarawak, Brunei and Nigeria, who may require more detailed information applicable to their own special problems. Where it is considered necessary, visits will be made to estates in Malaya as convenient. Visits to estates in other territories are by special arrangement. The only visits for which charges are normally made are those of our budding mandores. INTERVIEWS should be arranged by letter, as members of the senior research and advisory staff are frequently absent on visits to plantations.

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OF THE RUBBER RESEARCH INSTITUTE OF MALAYA

Kuala Lumpur July 1957 Number 31

Editorial: Nutritional Needs of Hevea

When rubber trees were first planted commercially in Malaya some fifty years ago, the young plants were usually grown in newly cleared jungle soil and left very much to themselves, apart from the control of weeds and removal of water from flat and low lying ground. In most instances they made reasonable progress although lack of attention to their manurial requirements was probably fostered by the false impression of soil richness and fertility given by the luxuriance of the jungle before it was cleared. Later, as the trees matured, the need for economy in maintenance and for ease of inspection dictated a policy of clean weeding. This was the origin of nutritional disorders, although they were at first not recognised as such. Furthermore the condition of the trees did not always improve when cover plants came to be encouraged in order to protect the soil. Indeed, the uncontrolled growth of indiscriminate mixtures of cover plants often depleted the nutrient and moisture supplies for the main crop of hevea.

The history of the manuring of hevea in Malaya has been based on the slow but sure accumulation of information and experimental data. Early manuring trials made no cognizance of the minor plant food constituents, but were simple comparisons of performance after manuring with fertilisers containing either nitrogen only, or the three major plant foods – nitrogen, phosphate and potash – in such proportions as were fixed for the proprietary fertilisers then available.

This issue of *Planters' Bulletin* presents the latest information available on the manurial requirements of hevea. We know that on most soils in Malaya phosphate and nitrogen are the major needs for good growth during early years, and that a fertiliser containing nitrogen, phosphate and potash should be used in order to maintain optimum yields of latex. A proper interpretation of the results obtained from manurial field trials has been provided by the statisticians, who have made appreciable advances in the design of field experiments, while plant nutrition specialists have contributed to the information as a result of their new techniques. The analysis of plant tissues, coupled with the technique of growing plants in specially purified sand under controlled conditions of nutrition, is giving a clearer insight into the food requirements of trees than could be obtained from the older methods of soil and fertiliser analysis. Following on the results obtained artificially, from pot culture, information is now beginning to accrue concerning the role of minor elements in the nutrition of mature hevea in the field, where some of the deficiency symptoms observed in our experiments have yet to be recognised.

How the nutrition of the rubber tree relates to the formation of latex still remains a mystery to be revealed. Photosynthesis takes place in

the leaves, using carbon dioxide from the atmosphere and water and mineral ions taken up from the soil, to form carbohydrates and other complex organic substances. Somewhere in the tree a further transformation occurs whereby the rubber molecules accumulate in the latex vessels between the outer bark and the inner cambium.

Two other developments of rubber research have led to means of increasing latex yields—the one by raising the intrinsic yielding capacity of planting material, and the other by treating the tapping panel with synthetic yield stimulants. Clearly, the higher output of rubber per acre which can result from these recent technical advances must ultimately be limited by the ability of the soil to maintain the trees in good health; in time, the capacity of the soil to afford nutrients will deteriorate. We shall therefore continue to study the nutrition of the rubber tree in relation to its yield capacity, as a major research project, and with perhaps more emphasis on the minor elements. Recent work in IndoChina suggests that the tree can only obtain maximum production of rubber when there is an optimum nutrient balance within leaves and within latex; the claim has been made that a study of the compositions of the foliage and latex enables a decision to be made as to the mineral supplements which the soil needs in order to raise a yield which is below average. We are now investigating these possibilities in Malaya by seeking to determine the limiting ratios for mineral nutrients in relation to the maximum yield of latex.

Effect of Manuring on Growth and Yield

WE ARE NOW ABLE TO PRESENT our main practical conclusions drawn from the results of seventeen long term manuring experiments in mature rubber areas*. All except one of the rubber areas under consideration were planted during the period 1935 to 1938, the exception being an area which was replanted in 1928. The seventeen trials include four replantings and thirteen new plantings, twelve of which were on land cleared from jungle. The trials are sited in different parts of the Federation of Malaya, five on coastal alluvial soils and the remaining twelve on inland soils.

Experimental manuring treatments started originally in the period 1935 to 1938 and continued at regular intervals up to the end of 1941 after which, by force of circumstance, no further manuring was done until 1947 or 1948. By then, the trees had been opened up for tapping. The manuring programme was resumed, with three biennial applications of fertilisers to all areas. Rates per tree were 2.4 lb sulphate of ammonia, 1.2 lb Christmas Island rock phosphate and 0.4 lb muriate of potash per application. Trees in all areas appeared healthy and vigorous when the post-war manuring programme was started. It should

* Preliminary conclusions were noted briefly in *Planters' Bulletin* 27, page 100. The full data from these experiments have since been subjected to detailed statistical analysis. A paper 'Manuring Hevea: Effects of Fertilisers on Growth and Yield of Mature Rubber Trees' by Mr G. Owen and Mr D.R. Westgarth will appear shortly in the *Journal of the Rubber Research Institute of Malaya.*

be borne in mind that in all except one of the seventeen trials the trees were less than twelve years of age and had been in tapping for not more than two years when the first post-war dressing was given. All areas carry stands of modern high yielding clonal seedlings or budgrafts, including clones Tjir 1 and PB 86 with other wellknown clones in a few areas.

Although we are concerned mainly with the effects of post-war applications of fertilisers on growth and yield, the influence of the earlier pre-war treatments has not been overlooked. But our main conclusions which follow are based on an analysis of girth increment data covering the period of six years following the first post-war application of fertilisers, and on yield data for the last four years of that period.

The main effect revealed by combining the results of the seventeen trials is due to applications of nitrogen in the presence of potassium, and to applications of phosphate. The potassium fertiliser produced no effect when applied by itself, and the response to nitrogen alone – in terms of both growth and yield of rubber – was small. But nitrogen and potassium applied together produced a better effect and the response increased steadily, at least up to about the sixth year after commencing the post-war programme, when the average increase in yield due to this treatment was 5.6 per cent and the average increase in girth increment was 16.3 per cent.

The results show that phosphate also has a beneficial effect on growth and yield. The response measured in the earlier stage of the post-war period of observation appears to have been due mainly to pre-war applications of phosphate, during the period of immaturity. There is evidence to indicate that the effect of this early treatment fades out, and there is a strong suggestion that the response to phosphate observed in later years was due mainly to the fertiliser which was applied after maturity. In the short period during which the data were recorded, the effect of phosphate on yield was small, averaging only about two per cent increase in each year. The effect on girth increment, however, increased steadily, averaging twelve per cent in the sixth year of recording. The rate of bark renewal is probably related to the rate of girthing and since phosphate treatment improves the one it can be expected to have a corresponding beneficial effect on the other. Yield records examined to date are related to the first cycle of tapping on virgin bark, which is not yet completed. We suppose that in the course of time, especially when renewed bark comes to be tapped, the yield response to phosphate will probably increase.

The percentage effects reported above should not be regarded as the likely average total response to manuring mature rubber trees. Our observations are based on an analysis of records covering a period of only about six years, following the first application of fertilisers in a programme providing for three biennial applications. In most of the trials the third application was given only in the final year of recording the data now under consideration. Clearly we cannot estimate the full effects of the manuring treatments at this stage. Marked upward trends appear both for the effect of nitrogen in the presence of potassium on yield and growth, and for the effect of phosphate on girth increments. We can therefore expect with some confidence that the

total benefit on rubber production will eventually be appreciably greater, when the full effects of the manuring programme have developed.

Comparison of the effects of fertilisers in trials on inland soils with those in trials on the heavier, artificially drained coastal alluvial soils shows that the responses differ markedly only in respect to phosphate. A response to phosphate – either in terms of growth or yield – is found mainly on inland soils, whereas there is little effect on the coastal soils. In the trials on inland soils the effect of nitrogen is marked only in the presence of potassium. On coastal alluvial soils, however, there is some indication of a response to nitrogen alone, although here also the effect may be enhanced in the presence of potassium.

Judged on the results of the seventeen trials under consideration, the most effective manuring treatment for the younger mature rubber areas on inland soils would appear to be one that provides for applications of fertiliser mixtures supplying nitrogen, phosphorus and potassium. The pattern of response on coastal alluvial soils is not quite so clear but the evidence suggests that applications of sulphate of ammonia alone can be regarded as effective for mature rubber trees in these areas, although here also there is an indication of an advantage if a potash fertiliser were applied in addition to sulphate of ammonia.

Magnesium Deficiency

BESIDES THE GENERALLY KNOWN PLANT REQUIREMENT for nitrogen, phosphorus and potassium, a definite need for other mineral elements exists. A member of this lesser known group of essential elements, of which the Malayan planter is becoming increasingly aware, is magnesium. An adequate supply of magnesium is essential for the health and wellbeing of the rubber plant if only for the reason that magnesium is an actual constituent of the chlorophyll molecule which is the green pigment found in leaves. Without chlorophyll the leaves would appear yellow, and the rubber plants would not survive as the green pigment is an essential component needed for the photosynthetic process. It is through this process that the rubber plant is able to manufacture its own carbohydrates and finally rubber itself; without an adequate supply of magnesium and thence chlorophyll the rubber plant would starve and finally perish.

Little is known about the magnesium status of Malayan soils but sufficient to indicate that in new planted areas the rubber plants do not usually show marked or severe magnesium deficiency symptoms. Of course, on eroded areas or hill tops magnesium deficiency may be encountered in new plantings but in comparison with replanted areas the occurrence is infrequent. As the replanted acreage increases so does the frequency of notification of the deficiency. Replanting in itself – quite apart from the common use of high yielding clones – can apparently be exhaustive of soil magnesium resources. In some instances the occurrence of magnesium deficiency in rubber replantings may be transient and the plants recover with time as their root spread increases and they

are able to tap new sources of supply. But all too often the severity of the deficiency may increase and the crop becomes severely retarded.

Our files do not indicate that magnesium deficiency was of wide pre-war occurrence and, in fact, not until about 1950-2 were some cases of interveinal yellowing classified as magnesium deficiency. Then also fertiliser mixtures containing magnesium supplements began to be marketed. We now know that magnesium deficiency of rubber trees is widespread in Malaya and although its occurrence is difficult to associate with any one soil type we can state that its frequency is greater on inland soils.

Leaflets showing typical magnesium deficiency symptoms.

Magnesium deficiency symptoms usually appear first in the leaves of the lower, or older, storeys of the plant. For young seedlings, where storey differentiation is marked, this type of distribution is clear and the leaves of the lower storeys contain much less magnesium than do those of the upper storeys. For older and mature trees, where there is no well marked storey differentiation, the symptoms seem liberally scattered over the crown, but always it is the leaves which have been borne longest which first produce symptoms. Magnesium deficiency symptoms are illustrated; the pattern is a regular one and produces a herring bone effect. The marginal and interveinal areas of the leaf become bright yellow whereas the block of tissue immediately surrounding the midrib remains green. Occasionally, but not always, a tip scorch of deficient leaves occurs and there may be brown necrotic areas between the lateral veins. When the deficiency is severe considerable leaf

fall will occur and the girthing of the rubber plant becomes retarded. Some clones, for instance PB 86, appear to be more susceptible than others but this cannot always be reconciled with a lower magnesium content of the leaves. A reputation for such apparent sensitivity seems to be given not because such clones require more magnesium but rather because they retain their obviously deficient leaves for a longer period, whereas other less sensitive clones shed them sooner.

For some deficiencies, the symptoms of nutritional disorder become obvious when the trees are brought into tapping or when the trees have been exploited for a long period. This is often so for potassium deficiency which, we find, occurs most frequently in the older mature rubber trees. However, in regard to magnesium deficiency the symptoms frequently occur in young plants and also in mature trees, which implies that a consistent and sufficient supply of magnesium must always be made available for good growth.

REMEDIAL MEASURES

If the deficiency is of slight severity but anticipated to become more severe with time, a good method of control is to supply the magnesium fertiliser mixture equivalent to that which would otherwise be used in the planting schedule. For instance, if as under conditions of good soil magnesium status and where no symptoms of magnesium deficiency are anticipated, 8 oz of R.R.I. fertiliser mixture M are due to be supplied to 18 month seedlings this amount should be changed to 8 oz of R.R.I. magnesium mixture M when symptoms of deficiency are being observed. Magnesium mixtures differ from the corresponding standard mixtures in that they contain a small proportion of magnesium added in the form of kieserite (magnesium sulphate).

It is sometimes more convenient to adhere to the original manuring schedule as laid down and supply magnesium from a separate source, such as magnesium limestone. The latter has the advantage of cheapness and is locally produced, but the disadvantage that it may act slower than the fertiliser mixtures containing magnesium, as supplied by various commercial firms. Where magnesium deficiency symptoms appear severe it is safe to add as much as 8 oz per point of magnesium lime or ground magnesium limestone up to the three year old stage. Beyond that age 16 oz may be applied with safety and even double or treble that amount for old mature trees. The response to magnesium limestone may sometimes, but not always, be disappointingly slow; it may take up to two years after the addition of the fertiliser to eliminate all symptoms of deficiency from the foliage of mature trees.

We often recommend a dressing of magnesium limestone, followed by a manuring programme with a magnesium fertiliser mixture. In severe instances of the deficiency, with much leaf fall, we recommend that kieserite (or Epsom salts) be used initially to remedy the deficiency. This appears quicker acting than magnesium limestone, but is more expensive and is more destructive if applied in excessive amounts. Its application should be in moderation and roughly equivalent to one half of the proportions of magnesium limestone which are given above.

Magnesium limestone could, with advantage, be applied to ground cover plants. Leguminous cover plants respond readily to magnesium

application and, generally, the limestone constituent of magnesium limestone may be expected to benefit them more than the rubber plant. Fertilisers broadcast on the cover plants are not wasted; as the cover plants become shaded out they presumably decompose and liberate their nutrient content to be absorbed by the rubber tree. We hope that one day we may obtain direct proof of this by employing radioactive isotopes; by means of these isotopes we should be able to follow the path and history of fertilisers applied to the cover plants, and to prove that essential minerals so applied do finally reach the rubber tree.

As magnesium deficiency is increasingly prevalent on replanted areas some estates have supplied a small amount of magnesium in the planting hole. This prophylactic measure may well be remunerative as there is evidence to suggest that the rubber plant in its earliest stages has a heavy requirement for magnesium.

Sheeting Batteries and the Law

We have pleasure in presenting a further guest article by the Deputy Chief Inspector of Machinery, Federation of Malaya. His article on 'Safeguarding Crepe Rubber Machinery' appears in Planters' Bulletin 28.

AN EMPLOYER WHO FAILS TO PROVIDE SAFE METHODS of work may, in the event of an accident, be faced with a suit for damages under common law. The defence of 'volenti non fit injuria', the plea that the workman had voluntarily assumed the risk of dangerous work and thereby released the employer from his liability, is accepted only in very special circumstances and never where a breach of a statutory duty is involved.

The Federation of Malaya imposes certain statutory duties on owners of machinery by the Machinery Ordinance, No. 18 of 1953. In so far as the machinery used in the manufacture of ribbed smoked sheet is concerned, the most important of those duties are briefly: (*i*) to guard or fence all moving parts so as to obviate danger to the public and the persons employed; (*ii*) to maintain the guarding; (*iii*) to provide means to positively prevent the hands of any operator from being brought into dangerous proximity to the line of contact, or 'nip', of the rolls; and (*iv*) to provide means to stop the machine within a period of of three seconds.

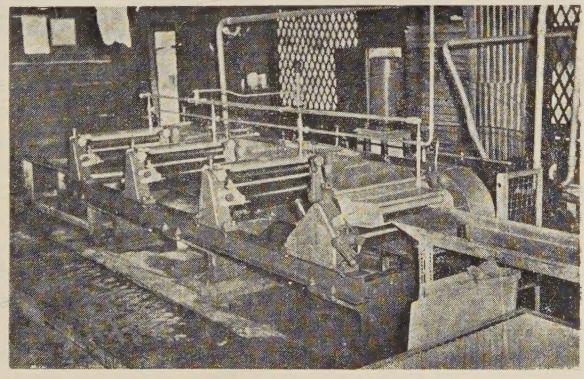


Figure 1. Arrangement of sheeting battery.

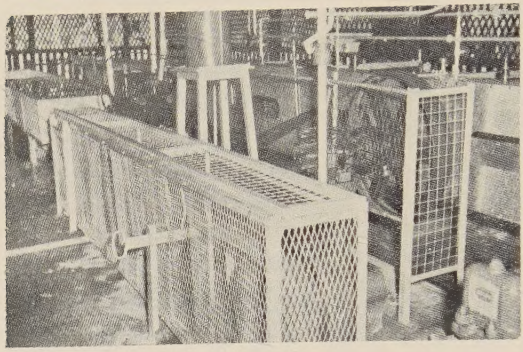


Figure 2. A good example of a totally enclosed drive.

Let us assume that the machinery in the factory consists of an oil engine driving a countershaft from which the continuous sheeter and the water pump are driven. *Figures 1* and 2 illustrate such an arrangement. To fulfil the first duty all moving parts have to be guarded – the engine flywheel, the driving and driven pulleys, the driving belts and the clutch. Often this is done by enclosing those parts within a rail fence. This method is cheap and satisfactory provided the fence is close to the parts it is intended to protect, and all operations such as starting the engine, resetting the clutch, oiling and moving the pump belt shifter can be carried out from outside the fence. If there is sufficient space for a person to enter the enclosure the fencing does not provide full protection. Wood should not be used in the construction of the fences as it is likely to rot quickly. A suitable material is $\frac{3}{4}$ inch bore steel piping, or $1\frac{1}{4}$ inch $\times$ $1\frac{1}{4}$ inch angle iron. A better method is to fit individual guards of expanded metal, or to weldmesh around the flywheel, belt drives and clutch. *Figure 2* shows an expanded metal guard enclosing the water pump drive. *Figure 3* shows another view of the same battery. The expanded metal guarding over the clutch and the projection of the driving shaft beyond the pedestal bearing will be noted.

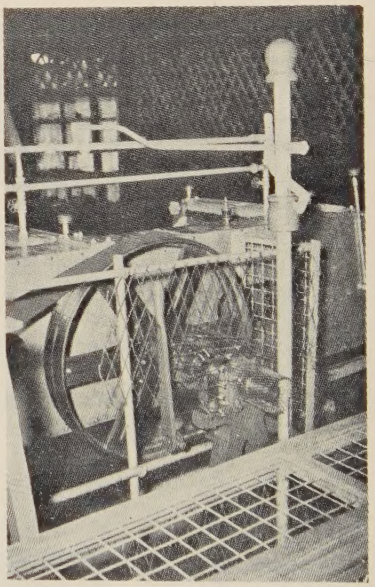


Figure 3. Guarding of clutch and clutch shaft end.

The second duty, to maintain the guarding, requires no elaboration. Obviously the guarding, if it is to provide any protection, must be maintained in a good state of repair and kept in position while the machinery is in use.

The third duty calls for a device to prevent the hands of operators from reaching the nips of the rolls. Here we are concerned only with the sheeting machine. There are some twentytwo models of continuous sheeter on the market, which differ but little, fundamentally. The only difference which concerns us here is that in certain of the smaller types the coagulum, once fed into the first roller head, need not be touched

by hand until the sheet is removed from the marking head. With other models it is customary to station one or more labourers at intermediate points, to guide the sheets into the rollers if necessary.

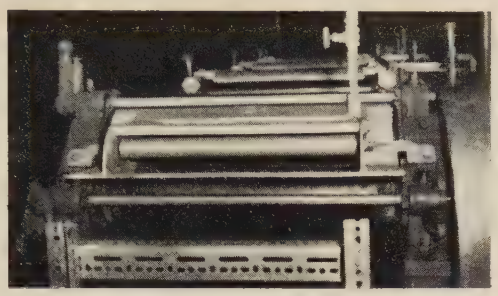


Figure 4. Fixed tunnel guard with adjustable roller opening.

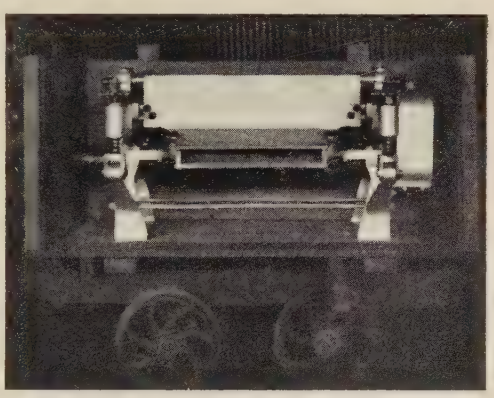


Figure 5. Fixed tunnel in cast aluminium.

The coagulum is in a soft plastic state when removed from the tank. Naturally, the attendant on the first head guides it into the rolls by gripping it near the leading edge. Formerly, this brought his fingers dangerously near the nip, and often he did not withdraw them in time. Prior to 1952 from twelve to fourteen such accidents were reported each year; most resulted in the amputation of one or more fingers. Up to then an adjustable roller finger guard was fitted a short distance in front of the rolls, and sufficiently above the feeding tray to permit the coagulum to be passed underneath. It will be realised that in dealing with coagulum of $1\frac{1}{2}$ to $1\frac{3}{4}$ inches thickness there was ample space for the attendant to slip his hand under the finger guard and reach the nip.

In 1952 a new form of guard, which came to be known as the 'tunnel guard', was introduced. This guard consists of a shaped aluminium plate which together with the feeding tray forms an open ended box through which the coagulum is fed. The end opening of the box, or tunnel, is the same width as the feeding tray and the height is just sufficient to allow the coagulum to pass freely. The distance of the opening from the line of contact of the rolls is made sufficient to prevent the operator's hand reaching the rolls. With a vertical opening of $1\frac{3}{4}$ inches this distance is fixed at not less than $7\frac{1}{2}$ inches. These dimensions vary with different arrangements of the first head, and for coagulum of exceptional thicknesses. The test it to place the hand palm downwards on the feeding tray and slide the former towards the rolls – if the upper edge of the tunnel guard touches the back of the hand or wrist before the tips of the fingers touch the rolls the dimensions are satisfactory.

Now that it is mandatory to fit the tunnel guard to the first head of every continuous sheeting machine, accidents are seldom reported with respect to this head. The few that have occurred were caused either by

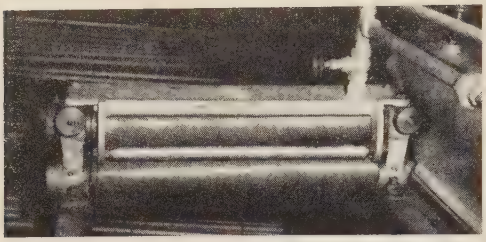


Figure 6. Marking roll head with conventional finger guard only.

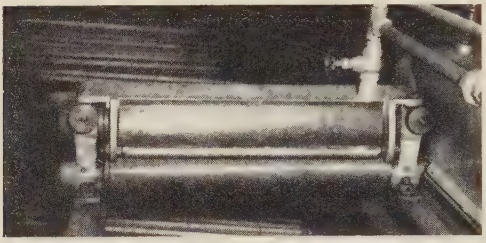


Figure 7. Marking roll head with plate covering upper roller.

removing the guard or by using a guard of such thin material that the operator could enlarge the opening by springing the top plate.

Figures 4 and 5 illustrate good examples of tunnel guards made in aluminium. In *Figure 4* a roller is used in place of the customary fixed upper edge of the opening. As the feeding tray is invariably narrower than the rolls it is essential to protect the nip on both sides of the tunnel guard. This is easily done by extending the plate forming the top part of the tunnel *(Figure 5)*.

A similar, though lesser, hazard exists on the other heads. Accidents on the marking head often result in more severe injuries than those on other heads. Because of the relatively low incidence of accidents on heads other than the first, tunnel guards are not compulsory on these heads. Finger guards are, however, essential. So long as it is kept in correct adjustment the finger guard gives good protection; it must be arranged so that the distance between it and the tray allows only sufficient clearance for the sheet to be passed through, and it must be sufficiently close to the upper roll to prevent the insertion of a finger. Sometimes it is difficult to comply with both requirements, particularly if the finger guard is of small diameter. There are two ways of overcoming this drawback: the finger guard may be replaced by a short tunnel guard, as is standard on one popular model, or a plate may be fixed in front of the upper roll with the lower edge touching the finger guard. *Figures 6* and *7* show the marking head without and with the plate fitted.

In at least two models the space between the first and marking heads is covered by a hinged wire grille, so connected with the clutch release mechanism that the machine cannot be started unless the grille is in position. This provides adequate protection at the second and subsequent heads so long as the interlocking gear is maintained in adjustment, and there are no openings between the heads of sufficient size to permit the insertion of an attendant's hand.

Some form of gearing is employed on all types of continuous sheeters to transmit the power to the various heads. The gearing may be chains and sprockets, worms and wormwheels, straight toothed gears, or combinations thereof. Mostly the gearing is totally enclosed and no further

protection is required. Where the power is transmitted by a horizontal shaft running the length of the battery a cover is necessary over the shaft and its couplings. The gearing is lubricated by either oil or grease and, except in those models where an oil bath is supplied drip feed lubricators and grease cups are provided. In *Figure 3* the accessibility of the oil and grease cups will be noticed.

The device to be provided to comply with the fourth duty, that is to stop the machine within the period of three seconds, is invariably of the falling weight clutch release type. A wire or rod runs the length of the machine and is connected to a latch holding a heavy weight (*Figure 3*). When the wire or rod is pulled the latch releases the weight which falls on the clutch lever and so disengages the clutch. Once the power is cut off, the machine usually comes to rest in less than three seconds. However in some modern machines, fitted with ball races in place of the usual solid bush bearings, this period may be exceeded and then a brake must be provided on the output side of the clutch. This brake must be arranged to act automatically as soon as the clutch is disengaged. On other machines it is often found that incorrect adjustment of the clutch causes it to drag and the machine continues to run after the falling weight has acted on the withdrawal lever. For that reason the emergency stopping device must be tested daily, with no material between the rolls.

Sometimes the trip wire is found to be carried on the water pipes over the various heads. In course of time these pipes become twisted and the lead of the trip wire is no longer straight. This may result in difficulty in operating the wire in an emergency. It is advisable to support the wire on light frictionless pulleys with as straight a lead as possible. Means should also be provided to take up any slack that may develop in the wire. The tripping wire or rod must be within easy reach of every attendant on the machine. The falling weight must be sufficiently heavy to keep the clutch disengaged when resting on the clutch lever, so as to prevent re-engagement of the clutch without re-setting the tripping mechanism. On some of the older machines it is not unknown for the driver to engage the clutch without raising the falling weight, thus allowing the machine to run without any emergency stopping device.

In the foregoing, the owners' statutory duties and the means of fulfilling them have been discussed in respect of the machinery employed in the production of RSS. No attempt has been made to deal with general duties imposed by law to ensure the safety, health and welfare of employees. Such factors as well maintained floors, ample ventilation, adequate working space, and good illumination, all contribute to the creation of safe working conditions.

Acknowledgments with respect to the photographs in this article are made to Messrs. United Engineers Ltd, The Escot Rubber Estates Ltd, and Harrisons and Crosfield (Malaya) Ltd.

A. NEILSON

Trial of the Holt Weed Breaker

A locally fabricated roller for crushing belukar was described in a guest article in Planters' Bulletin 12, and we now present an account of our recent trials with a proprietary implement.

THE HOLT WEED BREAKER is a heavy four bladed roller used for the mechanical control of upright cover plants. The two models recently given trials at our Experiment Station, a Mark VI and a Mark VIIIB, have an advantage over locally made implements in that they are suspended from a tool bar on the tractor hydraulic links, as the photographs show. The Mark VI is a gang type implement with three independent 28 inch rollers each weighing 356 pounds. The Mark VIIIB is a heavy duty model with a single 5 foot roller, weighing some 1200 pounds.

Our preliminary trials were only intended to determine whether the implements could do the job normally carried out by a slashing gang. The areas selected were under six year old rubber planted in 66 foot avenues. The covers included patches of Siam weed (*Eupatorium odoratum*) Straits rhododendron (*Melastoma polyanthum*), various grasses and *Mikania scandens*. Siam weed was chopped effectively, but Straits rhododendron stems more than half an inch thick were not completely severed. Nevertheless, the implements did a good job, leaving the field as if it had been well slashed to ground level, as shown in the first photograph.

Holt Weed Breaker Mk VIIIB operating in vigorous Siam weed.

Further trials were carried out in a seven year old replant with coarse covers similar to those in the earlier fields. Here again the implements did quite a satisfactory job, but we ran up against a problem we had already encountered in the earlier trials – that of attempting to carry out mechanical operations in areas which had not been cleared with such operations in mind. The old trees in this replant had been poisoned, and under the covers were many stumps and fallen logs in various stages of decomposition. The results were that much time was wasted when the tractor bogged or became jammed on a stump, and that a heavy repair bill was incurred which is not included in the costs given below. Moreover it was necessary to employ a boy with a knife to slash down those patches which the tractor had to avoid.

Holt Weed Breaker Mk VI in the raised position.

Rate of Work and Costs — Both models were timed over a single measured acre, and also over a ten acre block. The Mark VI model, being two feet wider than the Mark VIIIB, worked faster in open areas between avenue planting, but where the planting distance was 22 feet each implement required three runs to complete the strip and the width advantage was lost. The tractor used was a Nuffield Universal with Perkins diesel engine driven in third gear at about four or five miles per hour. The rates of work obtained under the conditions mentioned (but not allowing time for major stoppages) were as follows:

Model VI	—	$1\frac{1}{2}$ acres/hour,
Model VIIIB	—	1.1 acres/hour.

At the time of the trials our cost for the tractor employed averaged $2 (Malayan) per hour. To this must be added the hourly wage (say 35 cents) of the hand slashing man. On this basis costs per acre, exclusive of depreciations, were:

Model VI	—	$1.56 per acre,
Model VIIIB	—	$2.15 per acre.

However, over and above these costs there were, as mentioned above, heavy repair bills for the damage sustained in only 30 acres of work.

Long Term Effects — The further purpose of these trials was to observe the later effects of the implement both on the soil surface and on the cover plants. Where there was a thick cover of plants to cushion

Holt Weed Breaker Mk VIIIB in the lowered position.

the blades the soil was little disturbed, but where the surface was relatively unprotected the top inch or two of soil was thoroughly loosened – sufficiently to give erosion worries on sloping land. It was thought possible that repeated use of the implement might consolidate the soil below the surface, but in practice the implement could always be raised when passing over bare patches and the effect thus minimised. Plant material did not seem to be appreciably incorporated with the soil but was left, cut and flattened, as a rough carpet on the surface.

EFFECT ON COVER

The effect on the plant population was marked. Upright plants such as Straits rhododendron and Siam weed were chopped close to the ground, but they subsequently recovered in much the same time as they would after hand slashing to ground level. Where the cover was a mixture of grasses and soft creepers such as *Pueraria phaseoloides*, *Mikania scandens*, and *Passiflora foetida* however, there was a different story; for while the grasses were unharmed by the blades – there may even have been some encouragement of tillering and spread – the creepers received a severe setback and although they eventually recovered, it was only after there had been a considerable increase in the proportion of grasses. Since grasses compete strongly with rubber, this implies a severe criticism of the implement, for the selection in favour of the grasses would become more pronounced with repeated use of the machine.

An opposite effect was reported in the article 'Mechanical Cultivation and Belukar Crushing' (*Planters' Bulletin 12*), where leguminous creepers were encouraged by use of the machine and subsequent applications of phosphatic fertiliser. The difference is possibly due to the fact that in our trial the leguminour creepers were not initially so vigorous as those in the Dunlop experiments; they did not overgrow the upright plants, and were absent where these plants grew thickly. The cutting of the upright plants would thus have left patches of sparsely covered soil which would afford a foothold for invading grasses.

CONCLUSION

A recent development in the use of such machines as the Weed Breaker has involved the spraying of a herbicidal solution onto the cutting blades of the roller so as to apply the chemical directly and immediately to the cut and bruised stems. This is said to increase the efficiency of eradication of troublesome plants, but we have not yet tried the system.

To summarise, it appears that while this implement can effectively slash the upright cover plants, its use should be confined to areas specially cleared with mechanical operations in mind (otherwise it has little or no economic advantage over hand slashing at present rates of pay) and to areas reasonably free from grasses. Of the two models tried, the Mark VI seemed more effective, since though it chopped no less well than the single heavy roller, its three small rollers were better able to follow the undulations of the ground.

Despatch of Pathological Specimens

MUCH ADVISORY WORK of the Pathological Division is of necessity carried out by correspondence, because of the size of the area served and the need to deal with problems as they arise. We wish to call attention to the ways in which planters can help to make this service more efficient, by letting us have suitable specimens accompanied by full information.

Collection of Specimens – Ideally, the aim in collecting diseased material should be to secure a specimen showing the condition of maximum development — after the plant tissues have been penetrated by the parasite but before decay from secondary organisms has set in. In practice it is best to send several specimens showing a range of symptoms. Diagnosis often entails making isolations of the parasite, and this is more readily done at an early stage of attack. Even the failure to isolate a pathogen, from a well chosen specimen, can be informative, signifying that the disease is probably not of parasitic origin.

Symptoms may appear in one part of a plant when the disease is actually attacking another. Hence if it is impossible to send the whole plant it is important to confirm the health of the parts not sent. Particularly is this true of root diseases, which cause defoliation and dieback of the shoots.

Packing – In order that plant specimens may arrive in good condition at the laboratory, care is needed in packing them. If they are wet, bacteria and moulds which develop in transit may obscure the disease symptoms. Packed dry, the pathogenic fungi in the tissues will remain dormant long enough to reach us alive. We recommend that leaves and flowers be pressed between sheets of dry newspaper stiffened with cardboard; shoots and branches can be packed loose in cardboard boxes; panels are sufficiently protected by wrapping them in sacking; roots are best crated.

For most insect specimens the fifty pack cigarette tin is entirely satisfactory. It should be ventilated by punching holes from the inside outwards, so that there are no sharp edges to damage the insects. Suitable food should be provided and, for subterranean species, the tin filled with loosely packed moist (but not wet) soil. Large cockchafer grubs must not be more than one in a tin, or they will injure each other; if there are not enough tins, the grubs can be sent in a compartmented box. Tins should be wrapped or boxed to keep them cool on the journey. A generous number of specimens should be despatched, whenever possible, to allow for lossees in transit.

It is helpful if all specimens are labelled to show their source and relation to each other; also, where a covering letter is not enclosed, the package should contain a reference to relevant correspondance. All packages should be addressed to the Director.

Information Required – Full details concerning the specimens will help us to make an accurate diagnosis of the trouble; equally, particulars about the plantation are necessary for us to frame advice on control measures. Although it is not possible to lay down a schedule suitable for every case, the scheme on the next page indicates the sort of information required; essential details are unlikely to be overlooked if it is followed systematically.

Planting information

Planting material and method of planting.
Clones or clonal seedlings.
Planting distances.
Dates of planting and budding.

Cultivation

Previous history of the land.
Nature of covers or cultivated intercrops.
Methods of weeding.
Thinning.
Manurial treatment.

Local conditions

Soil type.
Slope and drainage of the land.
Weather conditions prior to the outbreak.
Other possible predisposing factors.

Description of the outbreak

Symptoms described in some detail, noting the presence of pests.
Area affected, the number or proportion of affected plants in the affected area and their distribution.
Control measures carried out.

As an experiment, we have prepared a form on which the information called for above can be recorded, for use by those sending specimens to us. It is hoped that this innovation will make it more satisfactory both for the sender, in providing the information, and for ourselves, in dealing with it. Two copies of the new form are enclosed with this issue,* to enable the sender to retain a duplicate. When we receive a completed form we shall forward two more as replacements. While the form is designed for reporting on hevea specimens, it can be used also for pathological specimens of cover crops, though some parts of the form will then be unwanted.

R. R. I. News

Commenting on the new 'Type Descriptions and Packing Specifications for Natural Rubber Grades used in International Trade', Mr R.G. Seaman, Editor of *Rubber World*, has observed that the general level of natural rubber quality decreases as the level of natural rubber price increases. This emerges from an analysis of imports into the United States. Conformance to RMA standards rose over the years 1951-54 to 72%, but for 1955 there was a drop to 63%.

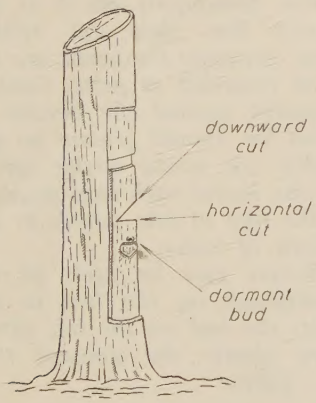
Rubber World asks each of the organisations that have co-operated in developing these international visual standards to urge all their members to make full use of them.

* Not included in issues initially distributed oversea. Attention is drawn to the most important notice PROHIBITED PLANT SPECIMENS inside the front cover of this issue.

Clone Abbreviation Code

	RULE	EXAMPLE	REMARKS
1	*Do not abbreviate less known clones*	Rantau Panjang *(in full)*	*Avoids ambiguity, and difficulty in recognition*
2	*Omit fullpoints*	AVROS *(Algemene Vereniging Rubber planters Oostkust Sumatra)*	*Brevity, clarity (especially in tables)*
3	ONE WORD NAME: *(a) use first syllable (b) or use first two letters if consonants*	Lun *(Lunderston)* Ch *(Chemara)*	*Never one letter only (See 5)*
4	MORE THAN ONE WORD: *initials only (capitals)*	PR *(Proefstation voor Rubber)*	*Capitals are used only for initial letters*
5	*If ambiguity would occur from using 3 or 4, employ longer abbreviation*	Sid *(Sidoredjo)* SReko *Sungei) Reko)*	*Not SR*
6	*Leave a space between clone abbreviations and serial number (and or letter)*	Pil B84 CI 72E	

Notching Dormant Buds



This technique may be used to stimulate the shooting of grafted buds which have failed to grow away after the stems of the seedling root stocks have been cut back.

The diagram above shows how a notch is made in the green budpatch about one quarter of an inch above the dormant bud. A sharp knife is used to cut well into the wood horizontally, to a depth of a quarter of an inch. The notch is completed by a downward cut, at an angle as shown. This method has given satisfactory results in practice.

Correspondence

The Editor invites letters of general interest for publication in this column. Comment and queries arising from articles recently published will be welcome.

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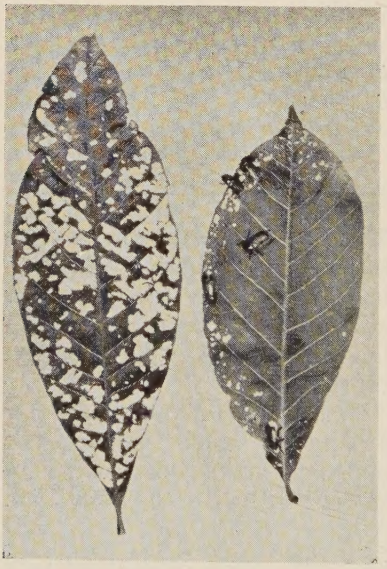
LEAF EATING BEETLES

I have an area of 80 acres on coastal alluvial clay where the old rubber was felled during the Japanese occupation for food crop cultivation. Afterwards the land went to sheet lalang, which was cleared last year by ploughing and rotovating. Germinated seed was planted in October. *Centrosema* cover, laid down in drills, is now smothering the heavy growth of sedge grass that came up after clearing. The area is strip weeded and planting points are mulched with cut lalang.



Growth has been vigorous, the plants showing no signs of the prolonged drought — some 120 days with less than 6 inches of rain. The leaves of the lowest storey, however, are being heavily attacked by beetles, specimens of which I am sending you. They are not seen during the day, but emerge at night in large numbers. As many as 20 may be seen and heard feeding on a single leaf, which is reduced to a skeleton of veins. They have also attacked some soft grasses along drain edges, but not to the same extent. In one or two places the *Centrosema* has been attacked but it is apparently unpalatable to the beetles and the damage is slight.

Though the atack is widespread in this clearing, it is not serious while it remains confined to the lowest storey. But, as I have not previously met such an attack, I shall be obliged for your advice.

Batu Kawan and Prye Estates

N.M. Glass

Manager

An interesting record of an occurrence we have not previously encountered. The beetle is Adoretus compressus, a small cockchafer known to attack many cultivated plants including cacao, which is sometimes damaged seriously. The grubs feed on roots or plant debris in the soil. They have been found in rubber plantations but it is not known that they eat rubber roots; certainly the grubs are not to be regarded as pests. Control measures against the beetles, if called for, should present no difficulty; we would advise spraying the leaves with lead arsenate at the rate of one pound to ten gallons of water.

Beetles can be seen in the photograph on the leaf to the right; the leaf on the left shows more clearly the damage they do. – Editor

R. R. I. Lectures to Planters

A revised list of lectures available this year follows. Please send the Director adequate notice of your requirement.

Current Thoughts on Ground Covers in Rubber Areas
Drying of Rubber
Latex Concentrate Preparation
Observations from Soils Division Field Experiments
Planting Material and Practice
Plant Protection: What to Use and How to Apply It
Recognition of Diseases (*evening lecture*)
Superior Processing Rubber
The Selection of Hevea Varieties
Tapping and Yield Stimulation
Where Research on Root Disease is Leading

OUR COVER PHOTOGRAPH THIS MONTH IS FROM YONG PENG SEONG STUDIOS AND APPEARS BY COURTESY OF THE MANAGER OF THE NATURAL RUBBER DEVELOPMENT BOARD, KUALA LUMPUR

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